

[< Back to results](#) | 1 of 1[Download](#) [Print](#) [Save to PDF](#) [Save to list](#) [Create bibliography](#)*Journal of Advanced Research in Applied Sciences and Engineering Technology* • *Open Access* • Volume 30, Issue 1, Pages 15 - 30 • March 2023**Document type**Article • *Hybrid Gold Open Access***Source type**

Journal

ISSN

24621943

DOI

10.37934/araset.30.1.1530

Publisher

Penerbit Akademia Baru

Original language

English

[View less](#)

Analytical and Numerical Simulation of Surface Pressure of an Oscillating Wedge at Hypersonic Mach Numbers and Application of Taguchi's Method

Shamitha^a; Crasta, Asha^a; Pathan, Khizar Ahmed^b; Khan, Sher Afghan^c [Save all to author list](#)^a Department of Mathematics, M.I.T.E, Moodabidri & Affiliated To VTU, Karnataka, Belgavi, India^b Department of Mechanical Engineering, Trinity College of Engineering and Research, Pune, India^c Department of Mechanical Engineering, Faculty of Engineering, IIUM, Gombak Campus, Kuala Lumpur, Malaysia[Full text options](#) [Export](#) [Abstract](#)[Author keywords](#)[SciVal Topics](#)

Abstract

This paper aims to estimate the surface pressure of a wedge at hypersonic Mach numbers at a considerable angle of incidence. The Ghosh similitude, corresponding strip theory, and piston theory are used to determine the pressure distribution analytically, and the results are compared to those of the CFD analysis. The theory is valid when the shock wave is attached to the leading edge of the nose of the wedge. Pressure on the windward surface was considered in the analysis. The pressure on the Lee

Cited by 0 documents

Inform me when this document is cited in Scopus:

[Set citation alert >](#)

Related documents

Numerical Simulation of Surface Pressure of a Wedge at Supersonic Mach Numbers and Application of Design of Experiments

Shamitha , Crasta, A. , Pathan, K.A.
(2023) *Journal of Advanced Research in Applied Mechanics*

Computational Analysis of Surface Pressure Distribution over a 2DWedge in the Supersonic and Hypersonic Flow Regimes

Shaikh, J.S. , Kumar, K. , Pathan, K.A.
(2023) *Fluid Dynamics and Materials Processing*

Analytical and computational analysis of pressure at the nose of a 2D wedge in high speed flow

Shaikh, J.S. , Kumar, K. , Pathan, K.A.
(2022) *Advances in Aircraft and Spacecraft Science*

[View all related documents based on references](#)[Find more related documents in Scopus based on:](#)[Authors >](#) [Keywords >](#)

surface is neglected. The condition for the validity of the theory is that the Mach number M_2 behind the shock wave is greater than 2.5. The parameters taken into account for the study are the wedge angle and Mach number. The range of wedge angle considered is from 5 to 25 degrees and the Mach number considered is from 5 to 15. The analytical and the CFD results are in good agreement. The findings indicate that the parameters like wedge angle and Mach number are influential parameters that influence the wedge surface static pressure. The surface static pressure rises with an increase in Mach number and wedge angle. © 2023, Penerbit Akademia Baru. All rights reserved.

Author keywords

Hypersonic; Mach number; Wedge angle

SciVal Topics 




References (31)


[View in search results format >](#)

All

Export

 Print

 E-mail

 Save to PDF

Create bibliography

-
- 1 Lighthill, Mo J.
Oscillating airfoils at high Mach number
(1953) *Journal of the Aeronautical Sciences*, 20 (6), pp. 402-406. Cited 245 times.
<https://doi.org/10.2514/8.2657>
-
- 2 Hayes, Wallace D.
On hypersonic similitude
(1947) *Quarterly of Applied Mathematics*, 5 (1), pp. 105-106. Cited 49 times.
<https://doi.org/10.1090/qam/20904>
-
- 3 Hui, W. H.
Supersonic and hypersonic flow with attached shock waves over delta wings
(1971) *Proceedings of the Royal Society of London. A. Mathematical and Physical Sciences*, 325 (1561), pp. 251-268. Cited 21 times.
<https://doi.org/10.1098/rspa.1971.0168>
-
- 4 Liu, D.D., Hui, W.H.
Oscillating delta wings with attached shock waves

(1977) *AIAA Journal*, 15 (6), pp. 804-812. Cited 23 times.
doi: 10.2514/3.7371

[View at Publisher](#)
-
- 5 Ghosh, K., Mistry, B.K.
Large incidence hypersonic similitude and oscillating nonplanar wedges

(1980) *AIAA Journal*, 18 (8), pp. 1004-1006. Cited 16 times.
doi: 10.2514/3.7702

[View at Publisher](#)
-

- 6 Ghosh, Kunal
HYPERSONIC LARGE-DEFLECTION SIMILITUDE FOR OSCILLATING DELTA WINGS.

(1984) *Aeronautical Journal*, 88 (878), pp. 357-361. Cited 22 times.

[View at Publisher](#)
-
- 7 Khan, S.A., Aabid, A., Saleel, C.A.
CFD simulation with analytical and theoretical validation of different flow parameters for the wedge at supersonic Mach number

(2019) *International Journal of Mechanical and Mechatronics Engineering*, 19 (1), pp. 170-177. Cited 45 times.
http://ijens.org/Vol_19_I_01/193101-4545-IJMME-IJENS.pdf
-
- 8 Crasta, Asha, Khan, S. A.
Hypersonic similitude for planar wedges
(2014) *International Journal of Advanced Research in Engineering and Technology*, 5 (2), pp. 16-31. Cited 9 times.
-
- 9 Crasta, Asha, Khan, S. A.
High Incidence Supersonic similitude for Planar wedge
(2012) *International Journal of Engineering research and Applications*, 2 (5), pp. 468-471. Cited 7 times.
-
- 10 Shaikh, J.S., Kumar, K., Pathan, K.A., Khan, S.A.
Analytical and computational analysis of pressure at the nose of a 2D wedge in high speed flow

(2022) *Advances in Aircraft and Spacecraft Science*, 9 (2), pp. 119-130. Cited 3 times.
<http://www.techno-press.org/?journal=aas&subpage=7www.techno-press.org/>
doi: 10.12989/aas.2022.9.2.119

[View at Publisher](#)
-
- 11 Pathan, K.A., Khan, S.A., Shaikh, A.N., Pathan, A.A., Khan, S.A.
An investigation of boat-tail helmet to reduce drag

(2021) *Advances in Aircraft and Spacecraft Science*, 8 (3), pp. 239-250. Cited 5 times.
<http://www.techno-press.org/?journal=aas&subpage=7www.techno-press.org/>
doi: 10.12989/aas.2021.8.3.239

[View at Publisher](#)
-
- 12 Khan, S.A., Fatepurwala, M.A., Pathan, K.N., Dabeer, P.S., Baig, M.A.A.
CFD analysis of human powered submarine to minimize drag

(2018) *International Journal of Mechanical and Production Engineering Research and Development*, 8 (3), pp. 1057-1066. Cited 20 times.
<http://www.tjprc.org/publishpapers/2-67-1529318360-111.IJMPERDJUN2018111.pdf>
doi: 10.24247/ijmperdjun2018111

[View at Publisher](#)
-

- 13 Pathan, K.A., Dabeer, P.S., Khan, S.A.
Influence of expansion level on base pressure and reattachment length

(2019) *CFD Letters*, 11 (5), pp. 22-36. Cited 26 times.
<http://www.akademiabaru.com/cfdl.html>
-
- 14 Pathan, Khizar Ahmed, Ashfaq, Syed, Dabeer, Prakash S., Khan, Sher Afgan
(2019) *Analysis of parameters affecting thrust and base pressure in suddenly expanded flow from nozzle*
-
- 15 Pathan, K.A., Dabeer, P.S., Khan, S.A.
An investigation of effect of control jets location and blowing pressure ratio to control base pressure in suddenly expanded flows (Open Access)

(2020) *Journal of Thermal Engineering*, 6 (2), pp. 15-23. Cited 15 times.
<http://eds.yildiz.edu.tr/journal-of-thermal-engineering/AjaxTool/GetArticleByPublishedArticleId?PublishedArticleId=4065>
doi: 10.18186/thermal.726106

View at Publisher
-
- 16 Pathan, K.A., Dabeer, P.S., Khan, S.A.
Effect of nozzle pressure ratio and control jets location to control base pressure in suddenly expanded flows

(2019) *Journal of Applied Fluid Mechanics*, 12 (4), pp. 1127-1135. Cited 31 times.
<http://www.jafmonline.net/>
doi: 10.29252/jafm.12.04.29495

View at Publisher
-
- 17 Pathan, K.A., Dabeer, P.S., Khan, S.A.
An investigation to control base pressure in suddenly expanded flows

(2018) *International Review of Aerospace Engineering*, 11 (4), pp. 162-169. Cited 45 times.
<https://www.praiseworthyprize.org/jsm/index.php?journal=irease&www.praiseworthyprize.com/irease.htm>
doi: 10.15866/irease.v11i4.14675

View at Publisher
-
- 18 Pathan, K.A., Dabeer, P.S., Khan, S.A.
Optimization of area ratio and thrust in suddenly expanded flow at supersonic Mach numbers

(2018) *Case Studies in Thermal Engineering*, 12, pp. 696-700. Cited 54 times.
<http://www.journals.elsevier.com/case-studies-in-thermal-engineering/>
doi: 10.1016/j.csite.2018.09.006

View at Publisher
-

- 19 Pathan, K.A., Khan, S.A., Dabeer, P.S.
CFD analysis of effect of flow and geometry parameters on thrust force created by flow from nozzle

(2017) *2017 2nd International Conference for Convergence in Technology, I2CT 2017*, 2017-January, pp. 1121-1125. Cited 39 times.
ISBN: 978-150904307-1
doi: 10.1109/I2CT.2017.8226302

View at Publisher
-
- 20 Pathan, K.A., Khan, S.A., Dabeer, P.S.
CFD analysis of effect of area ratio on suddenly expanded flows

(2017) *2017 2nd International Conference for Convergence in Technology, I2CT 2017*, 2017-January, pp. 1192-1198. Cited 43 times.
ISBN: 978-150904307-1
doi: 10.1109/I2CT.2017.8226315

View at Publisher
-
- 21 Pathan, K.A., Khan, S.A., Dabeer, P.S.
CFD analysis of effect of Mach number, area ratio and nozzle pressure ratio on velocity for suddenly expanded flows
(Open Access)

(2017) *2017 2nd International Conference for Convergence in Technology, I2CT 2017*, 2017-January, pp. 1104-1110. Cited 49 times.
ISBN: 978-150904307-1
doi: 10.1109/I2CT.2017.8226299

View at Publisher
-
- 22 Pathan, K.A., Dabeer, P.S., Khan, S.A.
Enlarge duct length optimization for suddenly expanded flows

(2020) *Advances in Aircraft and Spacecraft Science*, 7 (3), pp. 203-214. Cited 22 times.
<http://www.techno-press.org/download.php?journal=aas&volume=7&num=3&ordernum=2>
doi: 10.12989/aas.2020.7.3.203

View at Publisher
-
- 23 Shaikh, S.K., Pathan, K.A., Chaudhary, Z.I., Marlpalle, B.G., Khan, S.A.
An investigation of three-way catalytic converter for various inlet cone angles using CFD (Open Access)

(2020) *CFD Letters*, 12 (9), pp. 76-90. Cited 3 times.
<http://akademiabaru.com/submit/index.php/cfdl/article/view/1110/77>
doi: 10.37934/cfdl.12.9.7690

View at Publisher
-
- 24 Shaikh, S.K., Pathan, K.A., Chaudhary, Z.I., Khan, S.A.
CFD analysis of an automobile catalytic converter to obtain flow uniformity and to minimize pressure drop across the monolith (Open Access)

(2020) *CFD Letters*, 12 (9), pp. 116-128. Cited 5 times.
<http://akademiabaru.com/submit/index.php/cfdl/article/view/1115/83>
doi: 10.37934/cfdl.12.9.116128

View at Publisher

- 25 Pathan, K.A., Dabeer, P.S., Khan, S.A.
Investigation of base pressure variations in internal and external suddenly expanded flows using CFD analysis
(2019) *CFD Letters*, 11 (4), pp. 32-40. Cited 31 times.
<http://www.akademiabaru.com/cfdl.html>
-
- 26 Shaikh, Javed S., Kumar, Krishna, Pathan, Khizar A., Khan, Sher A.
Computational Analysis of Surface Pressure Distribution over a 2D Wedge in the Supersonic and Hypersonic Flow Regimes
-
- 27 Shamitha, Asha Crasta, Pathan, Khizar Ahmed, Khan, Sher Afghan
Numerical Simulation of Surface Pressure of a Wedge at Supersonic Mach Numbers and Application of Design of Experiments
-
- 28 Rathakrishnan, Ethirajan
(2020) *Gas Dynamic*. Cited 45 times.
Seventh ed. Delhi, Delhi: PHI Learning
-
- 29 Kanaani, Osamah Othman, Yagoub, Sami Abdelrahman Musa, Habib, Shabir, Aulia, Akmal, Hasiholan, Bonavian
Prediction of gas coning in hydrocarbon reservoir using tNavigator
(2021) *Progress in Energy and Environment*, 18, pp. 1-22.
<https://doi.org/10.37934/progee.18.1.122>
-
- 30 Nazer, Mohamed, Rostam, Muhammad Fadzrul Hafidz, Yong Eh Noum, Se, Hajibeigy, Mohammad Taghi, Shameli, Kamyar
Performance Analysis of Photovoltaic Passive Heat Storage System with Microencapsulated Paraffin Wax for Thermoelectric Generation
(2021) *Journal of Research in Nanoscience and Nanotechnology*, 1 (1), pp. 75-90. Cited 2 times.
<https://doi.org/10.37934/jrnn.1.1.7590>
-
- 31 Elfaghi, Abdulhafid MA, Abosbaia, Alhadi A., Alkbir, Munir FA, Omran, Abdoulhdi AB
CFD Simulation of Forced Convection Heat Transfer Enhancement in Pipe Using Al₂O₃/Water Nanofluid
(2022) *Journal of Advanced Research in Numerical Heat Transfer*, 8 (1), pp. 44-49. Cited 21 times.
<https://doi.org/10.37934/cfdl.14.9.118124>

✉ Khan, S.A.; Department of Mechanical Engineering, Faculty of Engineering, IIUM, Gombak Campus, Kuala Lumpur, Malaysia; email:sakhan@iium.edu.my

© Copyright 2023 Elsevier B.V., All rights reserved.

About Scopus

[What is Scopus](#)

[Content coverage](#)

[Scopus blog](#)

[Scopus API](#)

[Privacy matters](#)

Language

[日本語版を表示する](#)

[查看简体中文版本](#)

[查看繁體中文版本](#)

[Просмотр версии на русском языке](#)

Customer Service

[Help](#)

[Tutorials](#)

[Contact us](#)

ELSEVIER

[Terms and conditions](#) ↗ [Privacy policy](#) ↗

Copyright © Elsevier B.V. ↗. All rights reserved. Scopus® is a registered trademark of Elsevier B.V.

We use cookies to help provide and enhance our service and tailor content. By continuing, you agree to the use of cookies ↗.

